

## FCC 47 CFR PART 15 SUBPART C

## **CERTIFICATION TEST REPORT**

FOR

## GSM/WCDMA/LTE PHONE WITH BT & DTS WLAN b/g/n

MODEL NUMBER: LG-K373, LGK373, K373, LG-K373PR, LGK373PR, K373PR

FCC ID: ZNFK373

REPORT NUMBER: 16I22596-E2V2

**ISSUE DATE: 1/28/2016** 

Prepared for LG ELECTRONICS MOBILECOMM U.S.A., INC 1000 SYLVAN AVENUE ENGLEWOOD CLIFFS, NEW JERSEY, 07632, U.S.A

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NVLAP LAB CODE 200065-0

## **Revision History**

Rev.	Issue Date	Revisions	Revised By
V1	1/22/2016	Initial issue	D. CORONIA
V12	1/28/2016	Updated Section 8.8.1 & 8.8.3	D. CORONIA

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## **1. ATTESTATION OF TEST RESULTS**

COMPANY NAME:	LG ELECTRONICS MOBILECOMM U.S.A., INC.
EUT DESCRIPTION:	GSM/WCDMA/LTE PHONE WITH BT & DTS WLAN b/g/n
MODEL:	LG-K373, LGK373, K373, LG-K373PR, LGK373PR, K373PR
SERIAL NUMBER:	511CYZP000605, 511CYSF000606
DATE TESTED:	JANUARY 6 – 12, 2016
SERIAL NUMBER:	511CYZP000605, 511CYSF000606

APPLICABLE STANDARDS				
STANDARD TEST RESULTS				
CFR 47 Part 15 Subpart C Pass				

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revision section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC and ANSI C63.10-2013, FCC CFR 47 Part 2, and FCC CFR 47 Part 15.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
Chamber A	Chamber D
Chamber B	Chamber E
Chamber C	Chamber F
	Chamber G
	Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

# 4. CALIBRATION AND UNCERTAINTY

## 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

## 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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# 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 9KHz to 30 MHz	2.14 dB
Radiated Disturbance, 30 to 1000 MHz	4.98 dB
Radiated Disturbance,1000 to 6000 MHz	3.86 dB
Radiated Disturbance,6000 to 18000 MHz	4.23 dB
Radiated Disturbance, 18000 to 26000 MHz	5.30 dB
Radiated Disturbance,26000 to 40000 MHz	5.23 dB

Uncertainty figures are valid to a confidence level of 95%.

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## 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE PHONE WITH BT & DTS WLAN b/g/n

## 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range	Frequency Range Mode		Output Power	
(MHz)		(dBm)	(mW)	
2402 - 2480	Basic GFSK	9.94	9.86	
2402 - 2480	Enhanced 8PSK	11.21	13.21	

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode of showing compliance. For average power data, please refer to section 8.7.

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 1.25 dBi.

## 5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit on the channel with higher output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y, Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

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# 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List							
Description Manufacturer Model Serial Number FCC I							
AC Adapter	LG	MMCS-02WRE	N/A	N/A			
Earphone	LG	N/A	N/A	N/A			

#### I/O CABLES

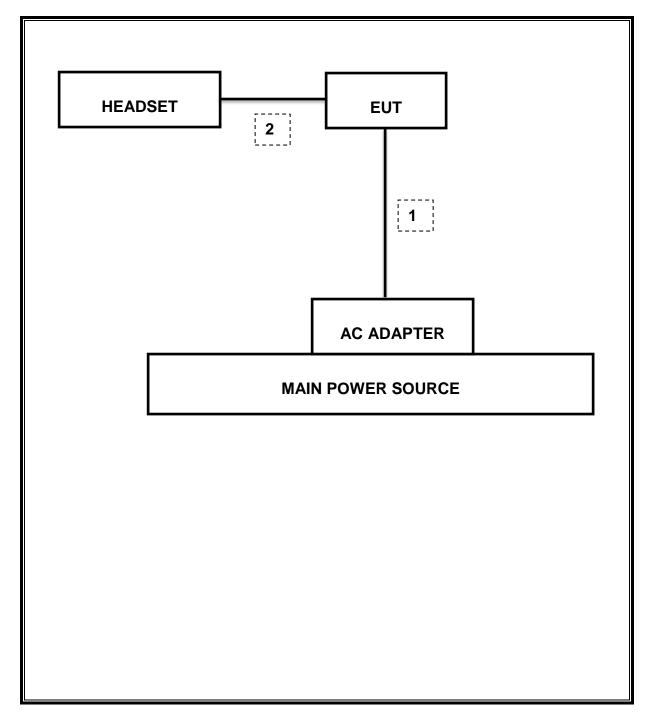
	I/O Cable List						
Cable	Cable Port # of identical Connector Cable Type Cable Remarks						
No		ports	Туре		Length (m)		
1	DC Power	1	Mini-USB	Shielded	1.2m	N/A	
2	Audio	1	Mini-Jack	Unshielded	1m	N/A	

#### TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests. EUT was set in the Hidden menu mode to enable BT communications.

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### SETUP DIAGRAM FOR TESTS



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# 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List						
Description	Manufacturer	Model	T Number	Cal Due		
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	185	02/18/16		
Antenna, Horn, 18GHz	ETS Lindgren	3117	119	01/15/16		
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	447	05/12/16		
RF Preamplifier, 1GHz - 18GHz	Miteq	NSP4000-SP2	88	04/07/16		
RF Preamplifier, 1GHz - 26.5GHz	HP	8449B	404	06/29/16		
Amplifier, 10KHz to 1 GHz	Keysight	8447D	15	08/14/16		
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	123	10/22/16		
Spectrum Analyzer, PXA, 3 Hz to 44 GHz	Keysight	N9030A	908	03/03/16		
Bluetooth Tester	Rohde & Schwarz	СВТ	438	04/24/16		
EMI Test Receiver, 9 KHz to 7 GHz	Rohde & Schwarz	ECSI7	284	09/10/16		
Peak Power Meter	Agilent / HP	E4416A	84	01/26/16		
Peak / Average Power Sensor	Keysight	E9327A	117	03/09/16		
LISN for Conducted Emission	FCC	50/250-25-2-01	1310	09/16/16		
Directional Coupler	Mini-Circuits	ZUDC10-183+	1140	CNR		
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	417	05/04/16		
High Pass Filter 6GHz	Micro-Tronics	HPS17542	893	04/25/16		
High Pass Filter 3GHz	Micro-Tronics	HPS17543	898	04/25/16		

Test Software List					
Description Manufacturer Model Version					
Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015		
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015		
Antenna Port Software	UL	UL RF	Ver 3.9.1, Dec 28, 2015		

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# 7. SUMMARY TABLE

FCC Part Section	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result
2.1049	RSS-GEN 6.6	Occupied Bandwidth (99%)	N/A		Pass
2.1051, 15.247 (d)	RSS-247 5.5	Band Edge / Conducted Spurious Emission	-20dBc		Pass
15.247 (b)(1)	RSS-247 5.4.2	TX conducted output power	<21dBm		Pass
15.247 (a)(1)	RSS-247 5.1.2	Hopping frequency separation	> 25KHz	Conducted	Pass
15.247 (a)(1)(iii)	RSS-247 5.1.4	Number of Hopping Channels	More than 15 non- overlapping channels		Pass
15.247 (a)(1)(iii)	RSS-247 5.1.4	Avg Time of Occupancy	< 0.4sec		Pass
15.207 (a)	RSS-GEN 8.8	AC Power Line conducted emissions	Section 10	Radiated	Pass
15.205, 15.209	RSS-GEN 8.9/7	Radiated Spurious Emission	< 54dBuV/m	Rauialeu	Pass

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# 8. ANTENNA PORT TEST RESULTS

## 8.1. ON TIME, DUTY CYCLE

#### **LIMITS**

None; for reporting purposes only

#### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

#### **RESULTS**

			ON TIME	AND DUTY	CYCLE R	ESULTS		
	Mode	ON Time	Period	Duty Cycle	Duty	Duty Cycle	1/T	
		В		x	Cycle	<b>Correction Factor</b>	Minimum VBW	
		(msec)	(msec)	(linear)	(%)	(dB)	(kHz)	
	GFSK	2.858	3.744	0.763	76.34%	1.17	0.350	
	8PSK	2.862	3.750	0.763	76.32%	1.17	0.349	
				DUTY CYCI	LE PLOTS			
		GFSK				8PSK		
	ent 15:33:56 Jan 6, 2016		L	Freq/Channel	🔆 Agilent 15:37:1			Channel
Ref 20 *Peak Log 10 dB/ 0ffst 10.6 dB *PAvg Center Res BW Marke 1a 2R 2a	2.8 2.8 2.441 000 GHz 2.441 000 GHz 8 MHz #VBI r Trace Type (1) Time (1) Time (1) Time (1) Time (1) Time	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	▲ Mkr2 3.744 ms -0.069 dB 2 2 3 3 4 4 5 5 9 4 4 6 7 ms (1001 pts) -0.87 dB 9.86 dBm -0.87 dB	Center Freq           2.44100000 GHz           Start Freq           2.44100000 GHz           Stop Freq           2.44100000 GHz           Stop Freq           2.44100000 GHz           Stop Freq           2.44100000 GHz           0.0000000 GHz           0.00000000 Hz           Signal Track           0n           Off	Ref 20 dBm           •Peak           Log           10           dB/           Offst           10.6           dB           •PAvg           •PAvg           Center 2.441 000           Res BW 8 MHz           Marker           1a           28           (1)           2a	*VBW 50 MHz Sweep Type X fixis Time 2,372 ms Time 2,372 ms Time 2,382 ms Time 3,375 ms	0,012 UD         2,4410           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           1         2           2         4           1         2           2         4           1         2           2         4           1         2           2         4           1         2           2         4           2         4           2         4           2         4           2         4           2         4           2         4           2         4           2         4           2         4           2         4           2         4           2         4           2         4           2         4           3         5           3         <	ter Freq 10000 GHz art Freq 10000 GHz 100 Freq 10000 GHz CF Step 10000 Hz Man q Offset 10000 Hz Man 10000 Hz Man 10000 Hz Man 10000 Hz Man 10000 Hz 10000 Hz
_	ht 2000-2010 Agilent Te ⊂•	chnologies			Copyright 2000-	2010 Agilent Technologies		
NOT	c							

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## 8.2. 20 dB AND 99% BANDWIDTH

#### <u>LIMIT</u>

None; for reporting purposes only.

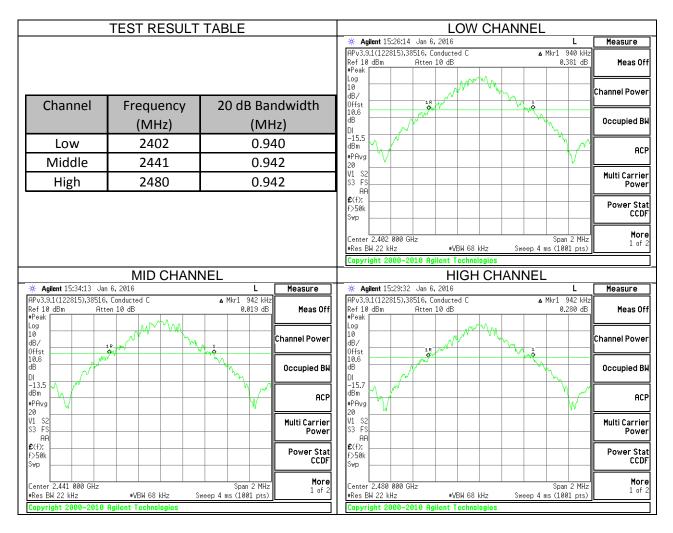
#### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq$  1% of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

#### **RESULTS**

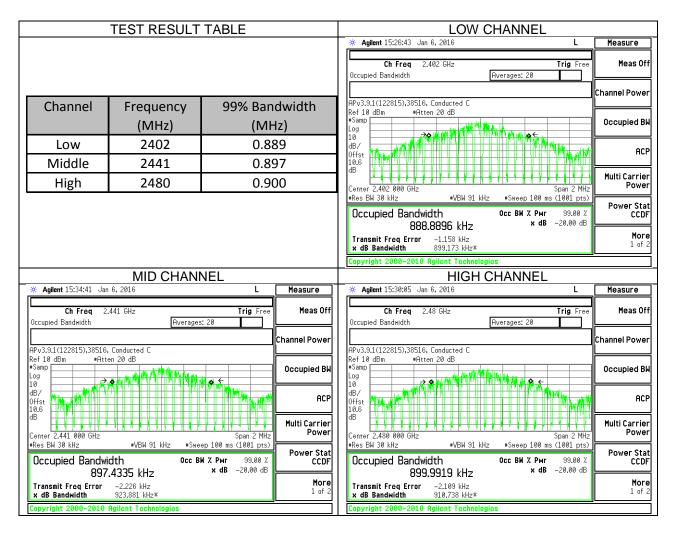
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## 8.2.1. GFSK 20 dB BANDWIDTH PLOTS AND TABLE



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## 8.2.2. GFSK 99% BANDWIDTH PLOTS AND TABLE



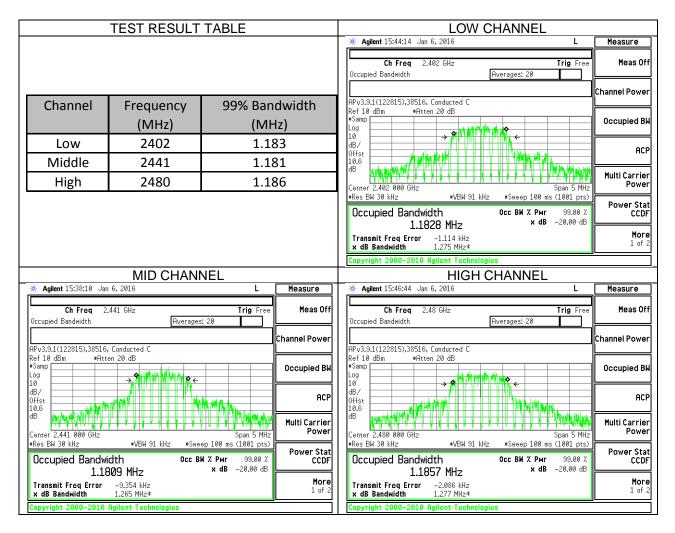
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## 8.2.3. 8PSK 20 dB BANDWIDTH PLOTS AND TABLE

	TEST RESULT	TABLE		LOW CHANNEL
				☆ Agilent 15:43:43         Jan 6, 2016         L         Measure           APv3.9.1(122815),38516, Conducted C         ▲ Mkr1         1.290 MHz
				Ref 10 dBm Atten 10 dB 0.982 dB Meas Off
				Log 10 10 Channel Power
Channel	Frequency (MHz)	20 dB Bar (MF		0ffst 10.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Low Middle	2402 2441	1.29		
High	2441	1.20		20 MUT Carrier V1 S2 MUT Carrier S3 FS Power
				£(f):         Power Stat           f>50k         CCDF
				Center         2.402         000         GHz         More           •Res BW 22         •VBW 68         KHz         Sweep 5.933 ms (1001 pts)         1 of 2
				Copyright 2000-2010 Agilent Technologies
🔆 Agilent 15:37:36 Jan	MID CHAN		Measure	HIGH CHANNEL
APv3.9.1(122815),38516,		▲ Mkr1 1.323 MHz -0.733 dB	Meas Off	APv3.9.1(122815),38516, Conducted C         ▲ Mkr1         1.263 MHz         Meas Off           Ref 10 dBm         Atten 10 dB         0.543 dB         Meas Off
Log 10 dB/	184 AMARINA MAR	a	Channel Power	Log 10 dB/ 0ffst 16 16 10 10 10 10 10 10 10 10 10 10
dB DI	¢		Occupied BW	10.6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
-17.4 dBm •PAvg 20		Whome	ACP	PRvg 20 Whythe All All All All All All All All All Al
V1 S2 S3 FS AA			Multi Carrier Power	V1 S2 S3 FS AR Multi Carrier Power
£(f): f>50k Swp			Power Stat CCDF	£(f):         Power Stat           f>50k         CCDF
Center 2.441 000 GHz •Res BW 22 kHz	#VBW 68 kHz Sweer	Span 3 MHz 5.933 ms (1001 pts)	More 1 of 2	Center 2.480 000 GHz         Span 3 MHz         More           •Res BW 22 kHz         •VBW 68 kHz         Sweep 5.933 ms (1001 pts)         1 of 2
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## 8.2.4. 8PSK 99% BANDWIDTH PLOTS AND TABLE



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# 8.3. HOPPING FREQUENCY SEPARATION LIMIT

FCC §15.247 (a) (1)

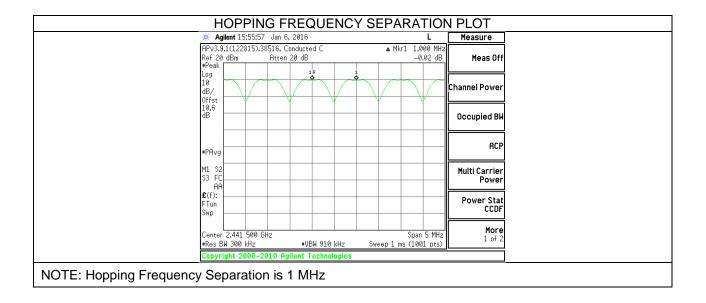
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

#### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### **RESULTS**



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# 8.4. NUMBER OF HOPPING CHANNELS

FCC §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

#### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

#### **RESULTS**

Normal Mode: 79 Channels observed.

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## 8.4.1. NUMBER OF HOPPING CHANNELS PLOTS

	)	
🕅 Agilent 15:53:38 Jan 6, 2016 🛛 🕹 👢	Measure	* Agilent 15:51:12 Jan 6, 2016 L Measur
Pv3.9.1(122815),38516, Conducted C ef 20 dBm Atten 20 dB Peak	Meas Off	APv3.9.1(122815),38516, Conducted C Ref 20 dBm Atten 20 dB Mea:
99 Ø B/ / / / / / / / / / / / / / / / / / /	Channel Power	Log 10 dB/ dB/ Offst
8.6	Occupied BW	10.6 dB DI 4.7
9.3 Bm gAv	ACP	4.7 dBm •PAvg
	Multi Carrier Power	M1 S2 S3 FC AB
ν	Power Stat CCDF	E(f): FTun Swp
tart 2.390 0 GHz Stop 2.490 0 GHz Res BW 1 MHz #VBW 1 MHz Sweep 20 ms (1001 pts)	More 1 of 2	Center 2.415 00 GHz Span 30 MHz 1 •Res BW 300 kHz •VBW 300 kHz Sweep 20 ms (1001 pts)
opyright 2000-2010 Agilent Technologies		Copyright 2000-2010 Agilent Technologies
umber of Hopping Channels (30 MHz Span, 2 <sup>nd</sup>	Segment)	Number of Hopping Channels (30 MHz Span, 3 <sup>rd</sup> Segmen
Agilent 15:51:51 Jan 6, 2016	Measure	* Agilent 15:52:39 Jan 6, 2016 L Measur
Pv3.9.1(122815),38516, Conducted C		APv3.9.1(122815),38516, Conducted C
ef 20 dBm Atten 20 dB Peak	Meas Off	Ref 20 dBm Atten 20 dB Mean
	Channel Power	Log 10 dB/ dB/ ffst
	Occupied BW	
5 3m	ACP	DI
5 3m PAVg L S2 8 FC	ACP Multi Carrier Power	dBm        •PAvg       M1 S2       S3 FC       PP
5 Sm 1 1 2 2 3 FC 3 FC 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Multi Carrier	dBm
55 Bm 27 PAvg 20 1 S2 3 FC 20	Multi Carrier Power Power Stat CCDF	dBm
5	Multi Carrier Power Power Stat CCDF	dBm         •PAvg         • </td

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## 8.5. AVERAGE TIME OF OCCUPANCY

## <u>LIMIT</u>

FCC §15.247 (a) (1) (iii)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

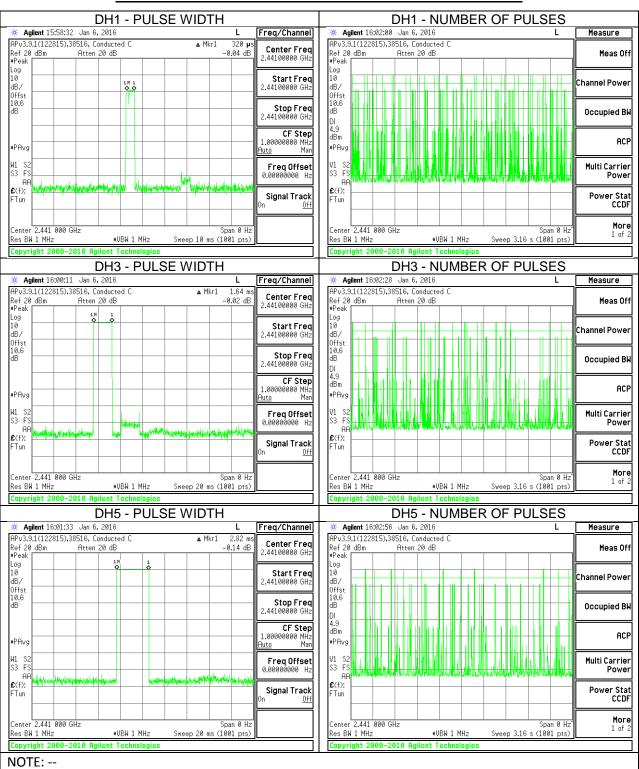
The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to 10 \* (# of pulses in 3.16 s) \* pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to 10 \* (# of pulses in 0.8 s) \* pulse width.

## <u>RESULTS</u>

		AV	ERAGE TIME	OF OCCUPANC	Y		
	DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)	
	GFSK Norma	I Mode					
	DH1	0.32	32	0.1024	0.4	-0.2976	
	DH3	1.64	18	0.2952	0.4	-0.1048	
	DH5	2.82	12	0.3384	0.4	-0.0616	
	DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)	
	GFSK AFH M	lode					
	DH1	0.32	8	0.02560	0.4	-0.3744	
	DH3	1.64	4.5	0.07380	0.4	-0.3262	
	DH5	2.82	3	0.08460	0.4	-0.3154	
NOTE:							

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#### Pulse Width and Number of Pulses in 3.16 Seconds Period Plots

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## 8.6. OUTPUT POWER

#### <u>LIMIT</u>

§15.247 (b) (1)

The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

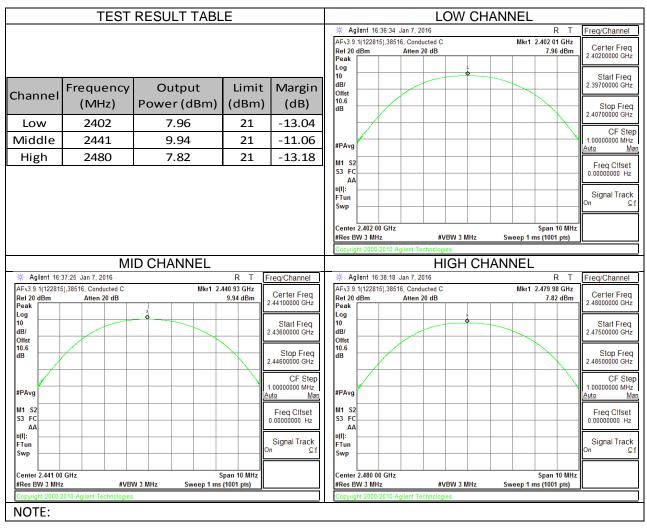
#### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

#### **RESULTS**

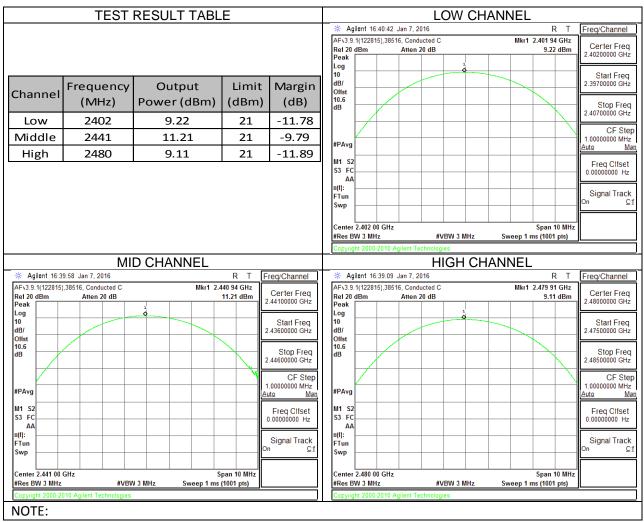
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## 8.6.1. GFSK OUTPUT POWER PLOTS AND TABLE



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## 8.6.2. 8PSK OUTPUT POWER PLOTS AND TABLE



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## 8.7. AVERAGE POWER

## <u>LIMIT</u>

None; for reporting purposes only.

## TEST PROCEDURE

DA 00-705: The transmitter output is connected to a power meter.

#### <u>RESULTS</u>

The cable assembly insertion loss of 10.6 dB (including 10 dB pad and 0.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

	BA	ASIC DATA RATE GI	-SK							
	Channel	Frequency (MHz)	Average Power (dBm)							
	Low	2402	7.2							
	Middle	2441	9.1							
	High	2480	7.5							
ENHANCED DATA RATE 8DPSK										
	Channel	Frequency (MHz)	(dBm)							
	Low	2402	5.7							
	Middle	2441	7.7							
	High	2480	6.0							
NOTE:										

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# 8.8. CONDUCTED SPURIOUS EMISSIONS

FCC §15.247 (d)

Limit = -20 dBc

#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

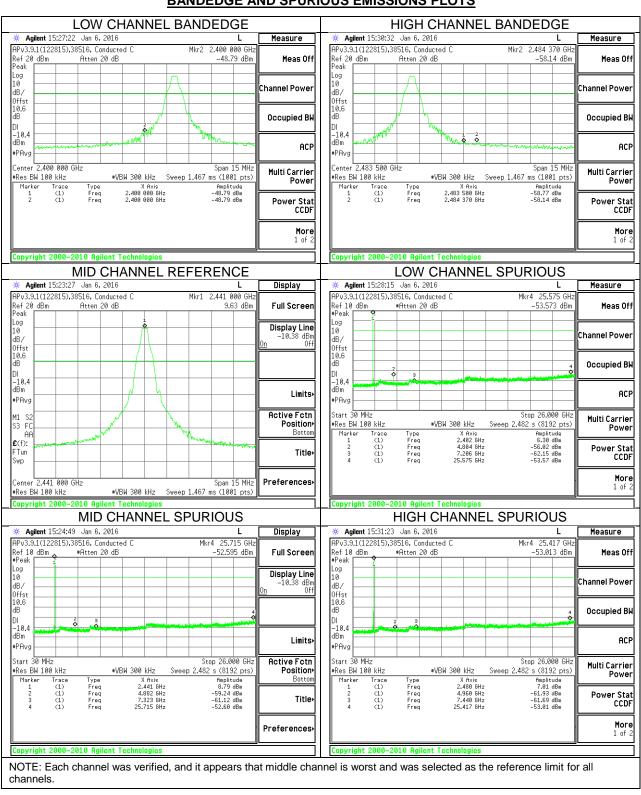
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

**RESULTS** 

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## 8.8.1. BASIC DATA RATE GFSK MODULATION NON-HOPPING MODE



#### **BANDEDGE AND SPURIOUS EMISSIONS PLOTS**

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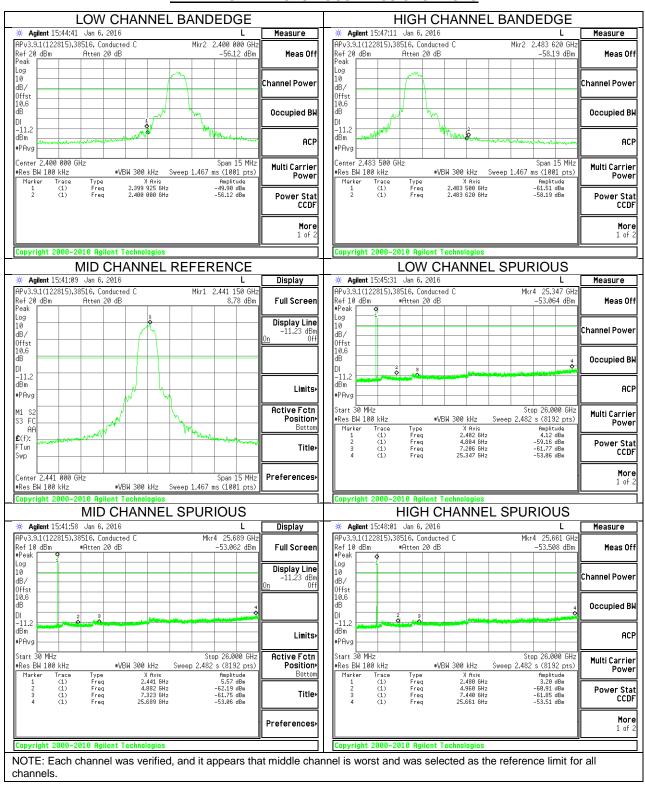
## 8.8.2. BASIC DATA RATE GFSK MODULATION HOPPING MODE SPURIOUS BANDEDGE EMISSIONS PLOTS

LOW CHANNEL BANDEDGE		HIGH CHANNEL BANDEDGE
	Measure	* Agilent 16:05:30 Jan 6, 2016 L Measure
APv3.9.1(122815),38516, Conducted C         Mkr1         2.407         020         GHz           Ref 20 dBm         Atten 20 dB         8.71         dBm         1         1           Peak         1         1         1         1         1         1	Meas Off	APv3.9.1(122815),38516, Conducted C Mkr2 2.484 010 GHz Ref 20 dBm Atten 20 dB -57.87 dBm <b>Meas Of</b> Peak
	Channel Power	Log 10 dB/ Offst
	Occupied BW	10.6 Occupied Bi
-11.3 dBm •PAvg	ACP	PAvg
Center 2.400 000 GHz Span 15 MHz *Res BW 100 kHz *VBW 300 kHz Sweep 1.467 ms (1001 pts) Marker Trace Type X Axis Amplitude	Multi Carrier Power	Center 2.483 500 GHz Span 15 MHz *Res BW 110 kHz *VBW 330 kHz Sweep 1.2 ms (1001 pts) Marker Trace Type X Axis Amplitude Marker Trace Type X Axis Amplitude
1 (1) Freq 2.407 020 GHz 8.71 dBm 2 (1) Freq 2.400 000 GHz -57.60 dBm 3 (1) Freq 2.399 820 GHz -51.01 dBm	Power Stat CCDF	1 (1) Freq 2.483 590 GHz -61.49 dBm 2 (1) Freq 2.484 010 GHz -57.87 dBm CCDF
	More 1 of 2	More 1 of 2
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## 8.8.3. ENHANCED DATA RATE 8PSK MODULATION NON-HOPPING MODE BANDEDGE AND SPURIOUS EMISSIONS PLOTS



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## 8.8.4. ENHANCED DATA RATE 8PSK MODULATION HOPPING MODE SPURIOUS BANDEDGE EMISSIONS PLOTS

LOW CHANNEL BANDEDGE		HIGH CHANNEL BANDEDGE
🔆 Agilent 16:13:28 Jan 6, 2016 🛛 🕹 🖌 🖌 🖌 🕹	Measure	🔆 Agilent 16:14:45 Jan 6, 2016 L Measure
APv3.9.1(122815),38516, Conducted C         Mkr1         2.406         990         GHz           Ref 20 dBm         Atten 20 dB         8.28 dBm         8.28 dBm         1         1         1	Meas Off	APv3.9.1(122815),38516, Conducted C Mkr2 2.484 145 GHz Ref 20 dBm Atten 20 dB -60.03 dBm <b>Meas Di</b> Peak
0ffst	Channel Power	Log how
10.6 dB DI -11.7 	Occupied BW	10.6 dB DI -11.7 -11.7
dBm •PAvg	ACP	dBm •PAvg AC
Center 2.400 000 GHz Span 15 MHz ■Res BW 100 kHz ■VBW 300 kHz Sweep 1.467 ms (1001 pts) Marker Trace Type X fixis fmplitude 1 (1) Freq 2.486 998 GHz 8.28 dBm	Multi Carrier Power	Center 2.483 500 GHz *Res BW 110 kHz Marker Trace Type 0.000 KHz Sweep 1.2 ms (1001 pts) Marker Trace Type 0.000 KHz Sweep 1.2 ms (1001 pts) Marker Trace Type 0.000 KHz Sweep 1.2 ms (1001 pts) Marker Trace Type 0.000 KHz Sweep 1.2 ms (1001 pts) Marker Trace Type 0.000 KHz Sweep 1.2 ms (1001 pts) Marker Trace Type 0.000 KHz Sweep 1.2 ms (1001 pts) Marker Trace Type 0.000 KHz Sweep 1.2 ms (1001 pts) Marker Trace Type 0.000 KHz Sweep 1.2 ms (1001 pts)
1 (1) Freq 2.406 990 GHz 8.20 dBm 2 (1) Freq 2.400 000 GHz -59.15 dBm 3 (1) Freq 2.399 580 GHz -53.79 dBm	Power Stat CCDF	1 (1) Freq 2.483 500 GHz -61.01 dBm 2 (1) Freq 2.484 145 GHz -60.03 dBm CCD
	<b>More</b> 1 of 2	Mor 1 of
Copyright 2000-2010 Agilent Technologies		Copyright 2000-2010 Agilent Technologies
NOTE:		

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# 9. RADIATED EMISSION TEST

#### <u>LIMITS</u>

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150cm for above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 1/T (on time) for average measurement.

The spectrum from 1GHzHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

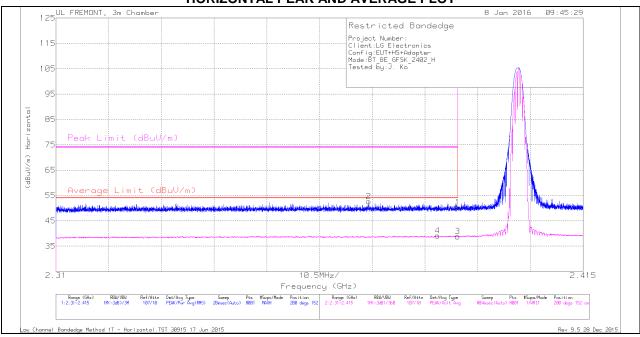
#### <u>RESULTS</u>

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## 9.1. TRANSMITTER ABOVE 1 GHz

## 9.1.1. BASIC DATA RATE GFSK MODULATION

## **RESTRICTED BANDEDGE (LOW CHANNEL)**



#### HORIZONTAL PEAK AND AVERAGE PLOT

#### HORIZONTAL DATA

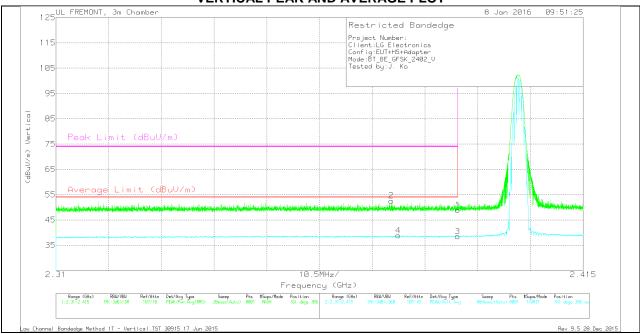
Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa	Corrected	Average Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
2	2.372	43.04	Pk	31.9	-22.3	52.64	-	-	74	-21.36	200	152	н
4	2.386	29.35	VA1T	32	-22.2	39.15	54	-14.85	-	-	200	152	н
1	2.39	40.44	Pk	32	-22.2	50.24	-	-	74	-23.76	200	152	н
3	2.39	29.01	VA1T	32	-22.2	38.81	54	-15.19	-	-	200	152	н

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

#### Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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#### VERTICAL PEAK AND AVERAGE PLOT

#### **VERTICAL DATA**

Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa	Corrected	Average Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
2	2.377	42.89	Pk	31.9	-22.2	52.59	-	-	74	-21.41	161	386	V
4	2.378	29.13	VA1T	31.9	-22.2	38.83	54	-15.17	-	-	161	386	V
1	2.39	39.17	Pk	32	-22.2	48.97	-	-	74	-25.03	161	386	V
3	2.39	28.75	VA1T	32	-22.2	38.55	54	-15.45	-	-	161	386	V

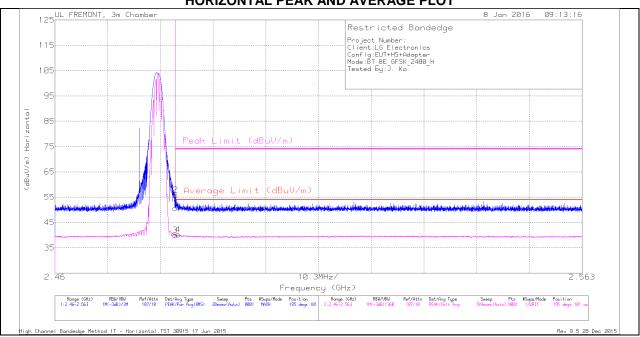
\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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## **AUTHORIZED BANDEDGE (HIGH CHANNEL)**



#### HORIZONTAL PEAK AND AVERAGE PLOT

#### HORIZONTAL DATA

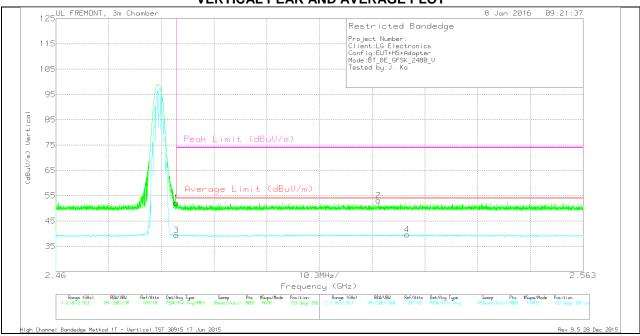
Marker	Frequency (GHz)	Meter Reading	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/Pa d (dB)	Corrected Reading	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	(dBuV) 40.41	Pk	32.3	-22	(dBuV/m) 50.71			74	-23.29	195	101	н
1	2.484	40.41	PK Pk	32.3	-22	55.91	-	-	74	-23.29	195	101	н
2	2.484	29.71	VA1T	32.3	-22	40.01	- 54	-13.99			195	101	н
3	-	-					-		-	-		-	
4	2.484	29.92	VA1T	32.3	-22	40.22	54	-13.78	-	-	195	101	н

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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#### VERTICAL PEAK AND AVERAGE PLOT

#### **VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa d (dB)	Corrected Reading	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
		(dBuV)				(dBuV/m)				. ,	1 .0.7		
1	2.484	41.83	Pk	32.3	-22	52.13	-	-	74	-21.87	193	396	V
3	2.484	29.01	VA1T	32.3	-22	39.31	54	-14.69	-	-	193	396	V
2	2.523	42.59	Pk	32.4	-21.9	53.09	-	-	74	-20.91	193	396	V
4	2.529	29.17	VA1T	32.4	-22	39.57	54	-14.43	-	-	193	396	V

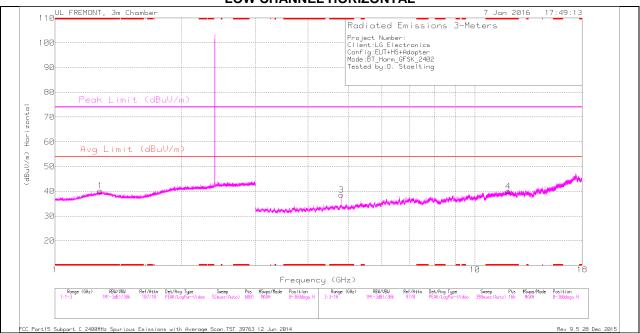
\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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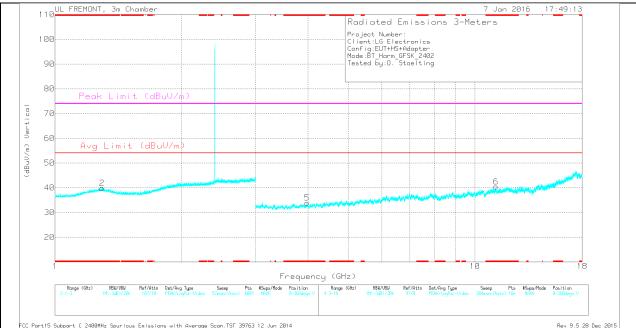
# HARMONICS AND SPURIOUS EMISSIONS



LOW CHANNEL HORIZONTAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### LOW CHANNEL VERTICAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### LOW CHANNEL DATA

#### TRACE MARKERS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/Pa d (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.281	33.75	Avg	29.7	-23.2	40.25	54	-13.75	-	-	0-360	100	н
2	* 1.295	33.14	Avg	29.8	-23.1	39.84	54	-14.16	-	-	0-360	100	V
3	* 4.804	33.63	Avg	34	-29.1	38.53	54	-15.47	-	-	0-360	200	н
4	* 12.002	24.1	Avg	39.1	-23.2	40	54	-14	-	-	0-360	200	н
5	* 3.982	30.95	Avg	33.2	-30.3	33.85	54	-20.15	-	-	0-360	200	V
6	* 11.213	24.95	Avg	37.9	-22.4	40.45	54	-13.55	-	-	0-360	100	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

#### RADIATED EMISSIONS

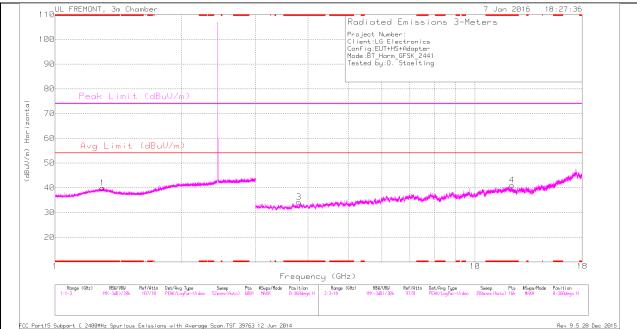
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa d (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.28	41.64	PKFH	29.7	-23.2	48.14	-	-	74	-25.86	337	344	Н
* 1.281	29.61	VA1T	29.7	-23.2	36.11	54	-17.89	-	-	337	344	Н
* 1.297	40.81	PKFH	29.9	-23.2	47.51	-	-	74	-26.49	207	152	V
* 1.297	29.61	VA1T	29.9	-23.2	36.31	54	-17.69	-	-	207	152	V
* 4.803	41.3	PKFH	34	-29.1	46.2	-	-	74	-27.8	83	198	Н
* 4.804	32.41	VA1T	34	-29.1	37.31	54	-16.69	-	-	83	198	Н
* 12.004	32.05	PKFH	39.1	-23.1	48.05	-	-	74	-25.95	285	101	Н
* 12.002	21.12	VA1T	39.1	-23.2	37.02	54	-16.98	-	-	285	101	Н
* 3.982	38.94	PKFH	33.2	-30.3	41.84	-	-	74	-32.16	19	228	V
* 3.983	27.16	VA1T	33.2	-30.3	30.06	54	-23.94	-	-	19	228	V
* 11.215	32.66	PKFH	37.9	-22.4	48.16	-	-	74	-25.84	321	104	V
* 11.214	21.01	VA1T	37.9	-22.4	36.51	54	-17.49	-	-	321	104	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

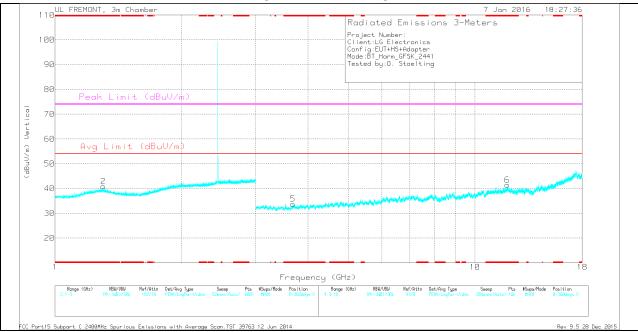
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#### **MID CHANNEL HORIZONTAL**

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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## **MID CHANNEL VERTICAL**

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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# MID CHANNEL DATA

#### TRACE MARKERS

Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbi/Fitr/Pa	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
1	* 1.296	33.21	Avg	29.9	-23.1	40.01	54	-13.99	-	-	0-360	100	Н
2	* 1.304	34.22	Avg	29.8	-23.2	40.82	54	-13.18	-	-	0-360	100	V
3	* 3.808	31.35	Avg	33.1	-30.2	34.25	54	-19.75	-	-	0-360	200	Н
4	* 12.258	25.36	Avg	38.9	-23.2	41.06	54	-12.94	-	-	0-360	100	н
5	* 3.682	30.46	Avg	33	-29.7	33.76	54	-20.24	-	-	0-360	200	V
6	* 11.943	25.98	Avg	39.1	-23.6	41.48	54	-12.52	-	-	0-360	100	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

#### RADIATED EMISSIONS

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa d (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.295	41.19	PKFH	29.8	-23.1	47.89	-	-	74	-26.11	331	133	Н
* 1.295	29.62	VA1T	29.8	-23.1	36.32	54	-17.68	-	-	331	133	Н
* 1.305	41.12	PKFH	29.8	-23.2	47.72	-	-	74	-26.28	161	126	V
* 1.304	29.55	VA1T	29.8	-23.2	36.15	54	-17.85	-	-	161	126	V
* 3.808	38.68	PKFH	33.1	-30.2	41.58	-	-	74	-32.42	29	226	Н
* 3.808	26.78	VA1T	33.1	-30.2	29.68	54	-24.32	-	-	29	226	Н
* 12.259	33.25	PKFH	38.9	-23.2	48.95	-	-	74	-25.05	105	115	Н
* 12.259	21.33	VA1T	38.9	-23.2	37.03	54	-16.97	-	-	105	115	Н
* 3.683	38.42	PKFH	33	-29.7	41.72	-	-	74	-32.28	83	357	V
* 3.682	26.51	VA1T	33	-29.7	29.81	54	-24.19	-	-	83	357	V
* 11.943	33.36	PKFH	39.1	-23.7	48.76	-	-	74	-25.24	340	159	V
* 11.941	21.81	VA1T	39.1	-23.7	37.21	54	-16.79	-	-	340	159	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

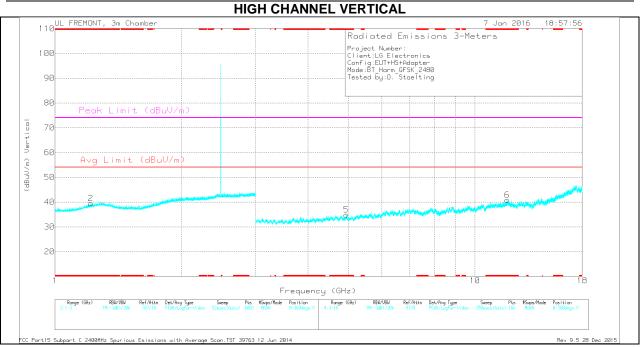
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#### HIGH CHANNEL HORIZONTAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### **HIGH CHANNEL DATA**

#### TRACE MARKERS

Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
1	* 1.315	33.74	Avg	29.7	-23.2	40.24	54	-13.76	-	-	0-360	100	н
2	* 1.216	33.43	Avg	29.1	-23.1	39.43	54	-14.57	-	-	0-360	200	V
3	* 4.798	30.4	Avg	34	-29.1	35.3	54	-18.7	-	-	0-360	200	н
4	* 11.355	25.35	Avg	38.1	-23.6	39.85	54	-14.15	-	-	0-360	100	н
5	* 4.937	30.32	Avg	34	-29.4	34.92	54	-19.08	-	-	0-360	200	V
6	* 11.941	25.5	Avg	39.1	-23.7	40.9	54	-13.1	-	-	0-360	100	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

# RADIATED EMISSIONS

Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
	(dBuV)				(dBuV/m)							
* 1.315	40.84	PKFH	29.7	-23.2	47.34	-	-	74	-26.66	129	399	н
* 1.317	29.5	VA1T	29.7	-23.2	36	54	-18	-	-	129	399	Н
* 1.215	41.82	PKFH	29.1	-23.1	47.82	-	-	74	-26.18	135	108	V
* 1.217	29.38	VA1T	29.1	-23.1	35.38	54	-18.62	-	-	135	108	V
* 4.798	38.84	PKFH	34	-29.1	43.74	-	-	74	-30.26	257	124	Н
* 4.796	26.47	VA1T	34	-29.2	31.27	54	-22.73	-	-	257	124	н
* 11.354	32.73	PKFH	38.1	-23.6	47.23	-	-	74	-26.77	145	100	н
* 11.357	21.84	VA1T	38.1	-23.6	36.34	54	-17.66	-	-	145	100	Н
* 4.936	38.44	PKFH	34	-29.4	43.04	-	-	74	-30.96	56	105	V
* 4.936	26.94	VA1T	34	-29.4	31.54	54	-22.46	-	-	56	105	V
* 11.939	34.27	PKFH	39.1	-23.7	49.67	-	-	74	-24.33	306	156	V
* 11.943	21.97	VA1T	39.1	-23.7	37.37	54	-16.63	-	-	306	156	V

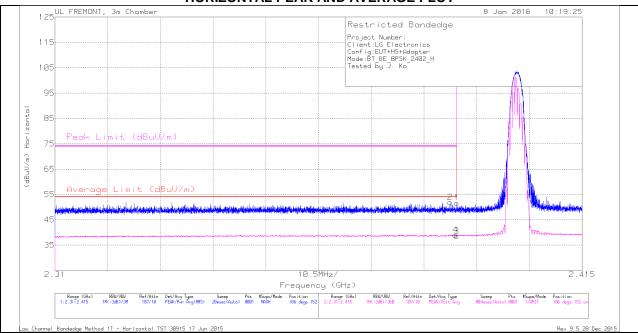
\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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# **RESTRICTED BANDEDGE (LOW CHANNEL)**



#### HORIZONTAL PEAK AND AVERAGE PLOT

#### HORIZONTAL DATA

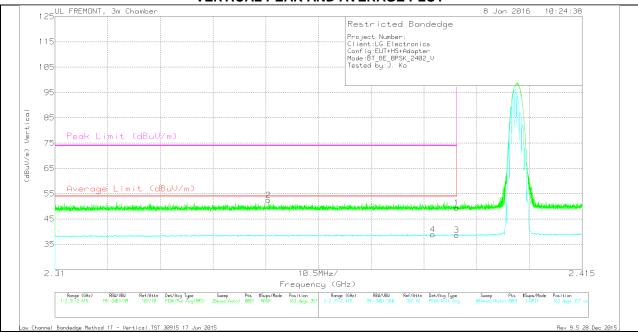
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	2.389	42.15	Pk	32	-22.2	51.95	-	-	74	-22.05	186	152	Н
1	2.39	41.92	Pk	32	-22.2	51.72	-	-	74	-22.28	186	152	н
3	2.39	28.87	VA1T	32	-22.2	38.67	54	-15.33	-	-	186	152	н
4	2.39	29.25	VA1T	32	-22.2	39.05	54	-14.95	-	-	186	152	н

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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#### VERTICAL PEAK AND AVERAGE PLOT

#### **VERTICAL DATA**

Marker	Frequency (GHz)	Meter Reading	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa d (dB)	Corrected Reading	Average Limit (dBuV/m)	Margin	Peak Limit (dBuV/m)	PK Margin	Azimuth	Height	Polarity
	(GHZ)	(dBuV)			a (as)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
2	2.353	42.92	Pk	31.8	-22.3	52.42	-	-	74	-21.58	163	357	V
4	2.385	29.12	VA1T	32	-22.2	38.92	54	-15.08	-	-	163	357	V
1	2.39	39.63	Pk	32	-22.2	49.43	-	-	74	-24.57	163	357	V
3	2.39	28.83	VA1T	32	-22.2	38.63	54	-15.37	-	-	163	357	V

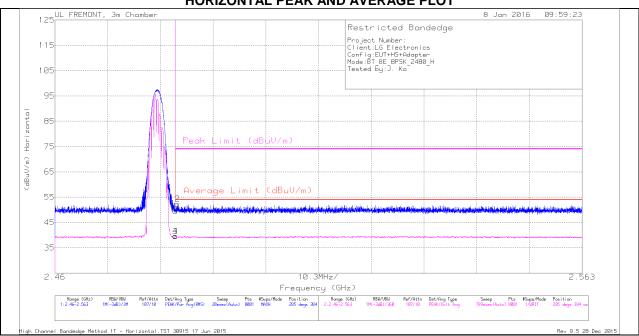
\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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# **AUTHORIZED BANDEDGE (HIGH CHANNEL)**



#### HORIZONTAL PEAK AND AVERAGE PLOT

#### HORIZONTAL DATA

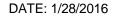
Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbl/Fitr/Pa	Corrected	Average Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
1	2.484	39.09	Pk	32.3	-22	49.39	-	-	74	-24.61	285	384	н
2	2.484	41.97	Pk	32.3	-22	52.27	-	-	74	-21.73	285	384	н
3	2.484	29.21	VA1T	32.3	-22	39.51	54	-14.49	-	-	285	384	н
4	2.484	29.27	VA1T	32.3	-22	39.57	54	-14.46	-	-	285	384	н

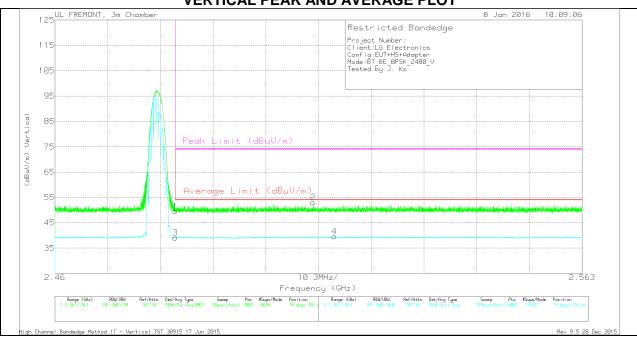
\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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# VERTICAL PEAK AND AVERAGE PLOT

#### **VERTICAL DATA**

Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa	Corrected	Average Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
1	2.484	39.29	Pk	32.3	-22	49.59	-	-	74	-24.41	78	376	V
3	2.484	28.81	VA1T	32.3	-22	39.11	54	-14.89	-	-	78	376	V
2	2.51	42.68	Pk	32.3	-21.9	53.08	-	-	74	-20.92	78	376	V
4	2.515	29.17	VA1T	32.3	-21.9	39.57	54	-14.43	-	-	78	376	V

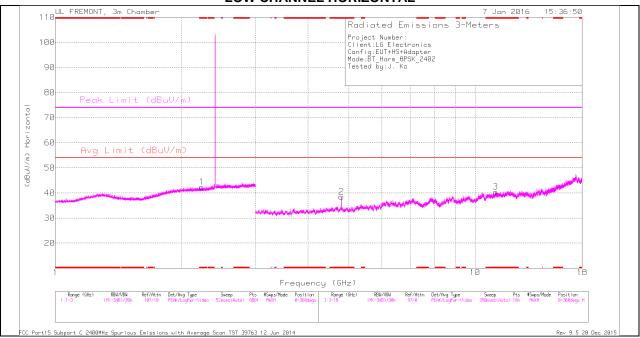
\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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# HARMONICS AND SPURIOUS EMISSIONS



LOW CHANNEL HORIZONTAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### LOW CHANNEL VERTICAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### LOW CHANNEL DATA

#### TRACE MARKERS

Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbi/Fitr/Pa	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
1	* 2.232	33.1	Avg	31.5	-22.2	42.4	54	-11.6	-	-	0-360	100	н
4	* 2.253	33.39	Avg	31.5	-22.3	42.59	54	-11.41	-	-	0-360	100	V
2	* 4.805	33.54	Avg	34	-29.1	38.44	54	-15.56	-	-	0-360	100	Н
3	* 11.203	25.02	Avg	37.9	-22.5	40.42	54	-13.58	-	-	0-360	100	Н
5	* 4.221	30.9	Avg	33.4	-29.7	34.6	54	-19.4	-	-	0-360	100	V
6	* 7.271	29.94	Avg	35.6	-27.6	37.94	54	-16.06	-	-	0-360	200	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

#### RADIATED EMISSIONS

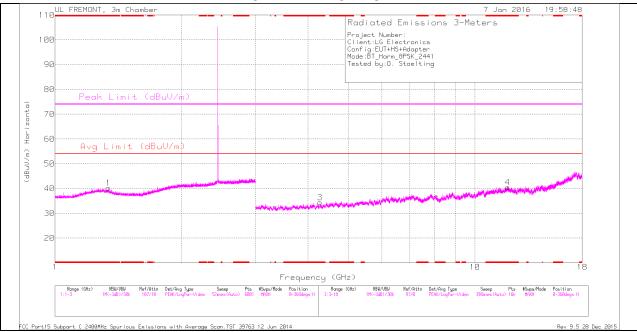
Frequency (GHz)	Meter Reading	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa d (dB)	Corrected Reading	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
	(dBuV)				(dBuV/m)							
* 2.23	41.05	PKFH	31.5	-22.2	50.35	-	-	74	-23.65	189	108	Н
* 2.232	29	VA1T	31.5	-22.2	38.3	54	-15.7	-	-	189	108	н
* 2.252	40.82	PKFH	31.5	-22.2	50.12	-	-	74	-23.88	94	108	V
* 2.255	28.92	VA1T	31.5	-22.3	38.12	54	-15.88	-	-	94	108	V
* 4.805	40.95	PKFH	34	-29.1	45.85	-	-	74	-28.15	263	222	Н
* 4.804	32.51	VA1T	34	-29.1	37.41	54	-16.59	-	-	263	222	Н
* 11.204	31.15	PKFH	37.9	-22.5	46.55	-	-	74	-27.45	74	301	Н
* 11.204	19.03	VA1T	37.9	-22.5	34.43	54	-19.57	-	-	74	301	Н
* 4.221	38.03	PKFH	33.4	-29.7	41.73	-	-	74	-32.27	228	214	V
* 4.221	26.27	VA1T	33.4	-29.7	29.97	54	-24.03	-	-	228	214	V
* 7.271	35.98	PKFH	35.6	-27.6	43.98	-	-	74	-30.02	187	321	V
* 7.273	24.42	VA1T	35.6	-27.6	32.42	54	-21.58	-	-	187	321	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

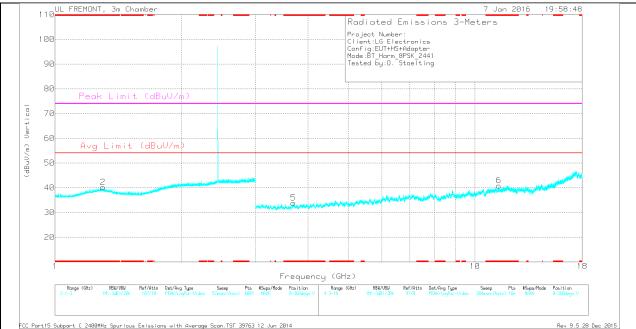
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## **MID CHANNEL HORIZONTAL**

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### **MID CHANNEL VERTICAL**

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### **MID CHANNEL DATA**

#### TRACE MARKERS

Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbi/Fitr/Pa	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
1	* 1.341	33.97	Avg	29.4	-23.1	40.27	54	-13.73	-	-	0-360	100	Н
2	* 1.3	33.55	Avg	29.9	-23.2	40.25	54	-13.75	-	-	0-360	100	V
3	* 4.271	31.22	Avg	33.4	-30.2	34.42	54	-19.58	-	-	0-360	100	Н
4	* 11.955	24.96	Avg	39.1	-23.6	40.46	54	-13.54	-	-	0-360	100	Н
5	* 3.695	30.37	Avg	33	-29.5	33.87	54	-20.13	-	-	0-360	100	V
6	* 11.387	26.32	Avg	38.2	-23.6	40.92	54	-13.08	-	-	0-360	100	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

#### RADIATED EMISSIONS

Frequency (GHz)	Meter Reading	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa d (dB)	Corrected Reading	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
(0112)	(dBuV)			u (ub)	(dBuV/m)	(aba t))	(0.5)	(4547))	(42)	(5683)	(0)	
* 1.343	40.92	PKFH	29.3	-23.1	47.12	-	-	74	-26.88	53	104	Н
* 1.341	29.59	VA1T	29.4	-23.1	35.89	54	-18.11	-	-	53	104	Н
* 1.3	40.97	PKFH	29.9	-23.2	47.67	-	-	74	-26.33	48	154	V
* 1.3	29.56	VA1T	29.9	-23.2	36.26	54	-17.74	-	-	48	154	V
* 4.27	38.45	PKFH	33.4	-30.1	41.75	-	-	74	-32.25	317	151	н
* 4.27	27.05	VA1T	33.4	-30.1	30.35	54	-23.65	-	-	317	151	Н
* 11.954	33.53	PKFH	39.1	-23.6	49.03	-	-	74	-24.97	70	122	Н
* 11.956	21.65	VA1T	39.1	-23.6	37.15	54	-16.85	-	-	70	122	Н
* 3.696	38.32	PKFH	33	-29.5	41.82	-	-	74	-32.18	120	120	V
* 3.694	26.48	VA1T	33	-29.5	29.98	54	-24.02	-	-	120	120	V
* 11.386	33.45	PKFH	38.2	-23.6	48.05	-	-	74	-25.95	14	150	V
* 11.389	21.75	VA1T	38.2	-23.5	36.45	54	-17.55	-	-	14	150	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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#### HIGH CHANNEL HORIZONTAL

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### **HIGH CHANNEL VERTICAL**

Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

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#### **HIGH CHANNEL DATA**

#### TRACE MARKERS

Marker	Frequency	Meter	Det	AF T119 (dB/m)	Amp/Cbi/Fitr/Pa	Corrected	Avg Limit	Margin	Peak Limit	PK Margin	Azimuth	Height	Polarity
	(GHz)	Reading			d (dB)	Reading	(dBuV/m)	(dB)	(dBuV/m)	(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)							
1	* 1.248	33.44	Avg	29.4	-23.2	39.64	54	-14.36	-	-	0-360	100	Н
2	* 1.271	34.12	Avg	29.6	-23.2	40.52	54	-13.48	-	-	0-360	200	V
3	* 4.276	31.05	Avg	33.5	-30.1	34.45	54	-19.55	-	-	0-360	200	Н
4	* 11	25.56	Avg	37.9	-23.1	40.36	54	-13.64	-	-	0-360	200	Н
5	* 4.808	30	Avg	34	-29.2	34.8	54	-19.2	-	-	0-360	100	V
6	* 11.94	24.93	Avg	39.1	-23.7	40.33	54	-13.67	-	-	0-360	100	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Avg - Video bandwidth < Resolution bandwidth

#### RADIATED EMISSIONS

Frequency (GHz)	Meter Reading	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pa d (dB)	Corrected Reading	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
(0.1.2)	(dBuV)			u (ub)	(dBuV/m)	(4547))	(0.5)	(4541))	(42)	(5683)	(0,	
* 1.246	41.74	PKFH	29.4	-23.2	47.94	-	-	74	-26.06	218	123	Н
* 1.248	29.63	VA1T	29.4	-23.2	35.83	54	-18.17	-	-	218	123	Н
* 1.272	41.18	PKFH	29.6	-23.2	47.58	-	-	74	-26.42	145	357	V
* 1.273	29.57	VA1T	29.6	-23.2	35.97	54	-18.03	-	-	145	357	V
* 4.277	38.34	PKFH	33.5	-30.1	41.74	-	-	74	-32.26	76	219	Н
* 4.276	27.08	VA1T	33.5	-30.1	30.48	54	-23.52	-	-	76	219	Н
* 10.999	32.38	PKFH	37.9	-23	47.28	-	-	74	-26.72	111	161	Н
* 10.998	21.59	VA1T	37.9	-23	36.49	54	-17.51	-	-	111	161	Н
* 4.806	38.65	PKFH	34	-29.2	43.45	-	-	74	-30.55	102	190	V
* 4.808	26.52	VA1T	34	-29.2	31.32	54	-22.68	-	-	102	190	V
* 11.939	33.7	PKFH	39.1	-23.7	49.1	-	-	74	-24.9	110	147	V
* 11.941	21.97	VA1T	39.1	-23.7	37.37	54	-16.63	-	-	110	147	V

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

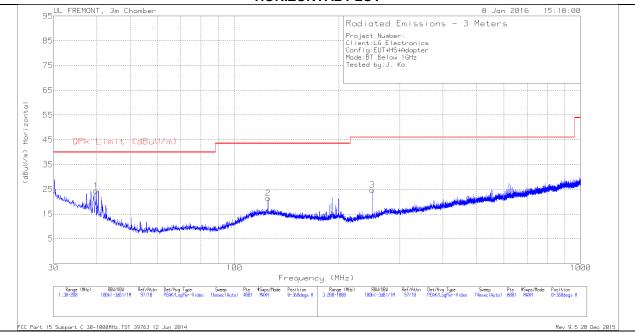
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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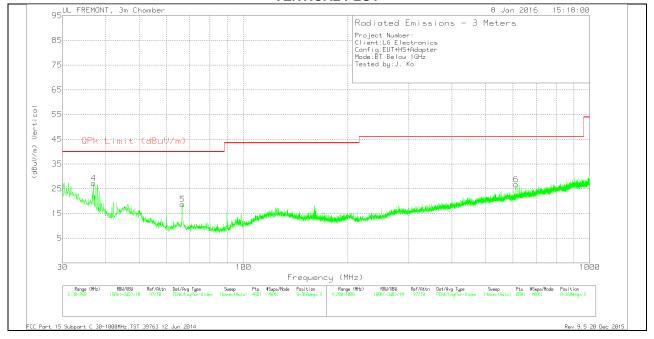
# 9.2. WORST-CASE BELOW 1 GHz

## GFSK SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



#### HORIZONTAL PLOT

# VERTICAL PLOT



UL VERIFICATION SERVICES INC. 47173 BENICIA STREET, FREMONT, CA 94538, USA TEL: (510) 771-1000 FAX: (510) 661-0888 This report shall not be reproduced except in full, without the written approval of UL Verification Services Inc.

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Marker	Frequency	Meter	Det	AF T185 (dB/m)	Amp/Cbl (dB)	Corrected	QPk Limit (dBuV/m)	Margin	Azimuth	Height	Polarity
	(MHz)	Reading				Reading		(dB)	(Degs)	(cm)	
		(dBuV)				(dBuV/m)					
4	36.885	37.7	Pk	16.6	-27.1	27.2	40	-12.8	0-360	100	V
1	39.775	37.05	Pk	14.5	-27.1	24.45	40	-15.55	0-360	400	н
5	66.5925	37.31	Pk	8.1	-26.7	18.71	40	-21.29	0-360	100	V
2	124.9875	33.43	Pk	14	-26	21.43	43.52	-22.09	0-360	200	н
3	249.95	37.91	Pk	11.5	-24.7	24.71	46.02	-21.31	0-360	100	н
6	612	32.6	Pk	18.7	-24.6	26.7	46.02	-19.32	0-360	100	V

#### **BELOW 1 GHz TABLE**

\* - indicates frequency in CFR15.205/IC 8.10 Restricted Band

Pk - Peak detector

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# **10. AC POWER LINE CONDUCTED EMISSIONS**

FCC §15.207 (a)

Frequency of Emission (MHz)	Conducted	Limit (dBuV)		
	Quasi-peak	Average		
0.15 – 0.5	66 to 56	56 to 46		
0.5 - 5	56	46		
5 - 30	60	50		

\*Decreases with the logarithm of the frequency.

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

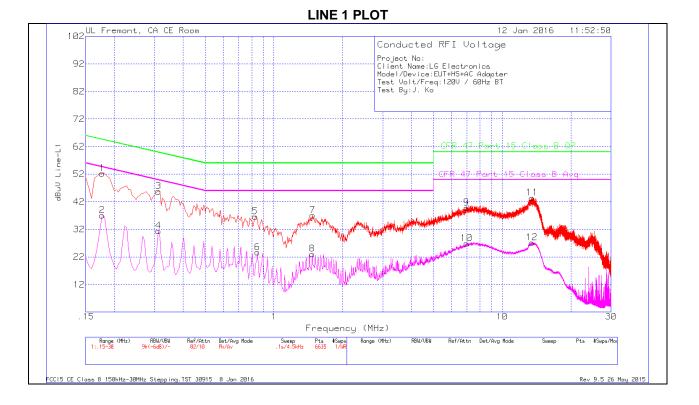
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

#### **RESULTS**

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#### **6 WORST EMISSIONS**



#### **LINE 1 RESULT**

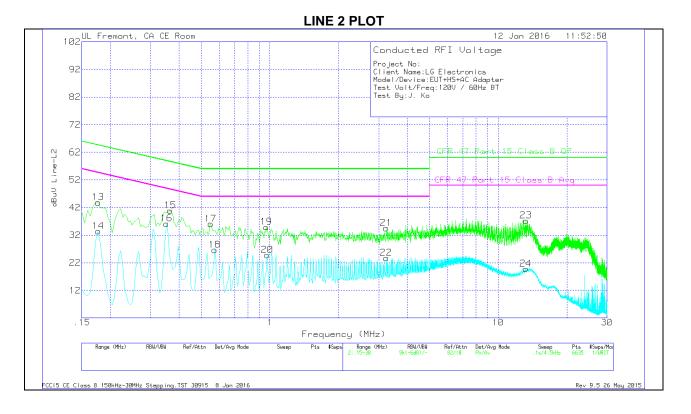
Marker	Frequency	Meter	Det	T1310 IL	LC Cables	Corrected	CFR 47	Margin	CFR 47	Margir
	(MHz)	Reading		L1	1&3	Reading	Part 15	(dB)	Part 15	(dB)
		(dBuV)				dBuV	Class B QP		Class B	
									Avg	
1	.177	52.25	Pk	0	0	52.25	64.63	-12.38		
2	.177	37.02	Av	0	0	37.02	-	-	54.63	-17.61
3	.312	45.77	Pk	0	0	45.77	59.92	-14.15		
4	.312	31.42	Av	0	0	31.42	-	-	49.92	-18.5
5	.8295	36.61	Pk	0	0	36.61	56	-19.39		
6	.8475	23.66	Av	0	0	23.66	-	-	46	-22.34
7	1.4775	36.95	Pk	0	.1	37.05	56	-18.95		
8	1.473	22.93	Av	0	.1	23.03	-	-	46	-22.97
9	6.9855	39.64	Pk	0	.1	39.74	60	-20.26		
10	6.9945	26.76	Av	0	.1	26.86	-	-	50	-23.14
11	13.5105	43.1	Pk	.1	.2	43.4	60	-16.6		
12	13.497	26.82	Av	.1	.2	27.12	-	-	50	-22.8

Range 1. Line-L1 15 - 30MHz

Pk - Peak detector

Av - Average detection

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#### **LINE 2 RESULT**

Range	2.	line-l2	15 -	30MHz
Nange	۷.	LINC-LZ	.12 -	20101112

nunge -	. Enic EE .15	0011112								
Marker	Frequency	Meter	Det	T1310 IL	LC Cables	Corrected	CFR 47	Margin	CFR 47	Margir
	(MHz)	Reading		L2	2&3	Reading	Part 15	(dB)	Part 15	(dB)
		(dBuV)				dBuV	Class B QP		Class B	
									Avg	
13	.177	43.82	Pk	0	0	43.82	64.63	-20.81		
14	.177	33.43	Av	0	0	33.43	-	-	54.63	-21.2
15	.366	40.85	Pk	0	0	40.85	58.59	-17.74		
16	.3525	36.12	Av	0	0	36.12	-	-	48.9	-12.78
17	.5505	36.04	Pk	0	0	36.04	56	-19.96		
18	.573	26.62	Av	0	0	26.62	-	-	46	-19.38
19	.9645	34.88	Pk	0	0	34.88	56	-21.12		
20	.9735	24.68	Av	0	.1	24.78	-	-	46	-21.22
21	3.2325	34.42	Pk	0	.1	34.52	56	-21.48		
22	3.2325	23.63	Av	0	.1	23.73	-	-	46	-22.27
23	13.218	36.93	Pk	.1	.2	37.23	60	-22.77		
24	13.2135	19.45	Av	.1	.2	19.75	-	-	50	-30.25

Pk - Peak detector

Av - Average detection